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## Operation and Control of Enzymatic Biodiesel Production

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**Abstract:** This work explores the control of biodiesel production via an enzymatic catalyst. The process involves the transesterification of oils/fats with an alcohol (usually methanol or ethanol), using enzymatic catalysts to generate mono-alkyl esters (the basis of biodiesel) and glycerol as by-product. Current literature indicates that enzymatic processing of oils and fats to produce biodiesel is technically feasible and developments in immobilization technology indicate that enzyme catalysts can become cost effective compared to chemical processing. However, with very few exceptions, enzyme technology is not currently used in commercial-scale biodiesel production. This is mainly due to non-optimized process designs, which do not use the full potential of the catalysts in a cost-efficient way. Furthermore is it unclear what process variables need to be monitored and controlled to ensure optimal economics. Critical to the project is to develop a control methodology to optimize the productivity of biodiesel production (e.g. the dosing of alcohol to minimize catalyst deactivation, minimization of waste and delivering consistent product quality meeting specifications).

For production of biodiesel (BD) via an enzymatic route, batch operation is a straightforward and efficient means for producing BD with its main disadvantage being the downtime between batches. For large-scale production of biodiesel, continuous operation is an attractive alternative as it enables efficient use of manpower and capital assets including equipment and raw materials. Currently our group is evaluating various process configurations for continuous BD production in packed bed reactors (PBRs), continuous stirred tank reactors (CSTRs) and a combination of the aforementioned reactors in series. These configurations will be reviewed to identify the process variables that need to be monitored and controlled.

**Keywords:** Biodiesel, Enzymatic, transesterification, Modelling and Simulation, Process control

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